The Effects of Ice Formation on Gas Transfer in Fresh and Salt Water Environments as Seen Through an Infrared Lens

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This project is a data analysis of a data set collected in relation to air sea-ice gas exchange. Oceans act as a sink for all greenhouse gases such as Carbon Dioxide and Oxygen (Semiletov et al. 2004), so it is important to understand exactly how gas is exchanged between the water and atmosphere. Ice coverage on the globe continues to change as temperatures rise, and studying the role ice specifically plays in gas exchange can give insight into how the ocean contributes to the global carbon cycle when there is less total ice coverage. The data set that was collected involved growing ice in a temperature controlled tank and recording gas concentrations, temperatures, and the process of ice formation through an infrared lens. The data analysis showed that transfer rates for saltwater were lower than those for freshwater, but they all followed a similar trend with three distinct regimes for each transfer rate: a period of slowly decreasing transfer rate, a rapid decrease in transfer rate when the temperature reached a minimum, and the point at which the transfer rate is zero at full ice coverage (no gas is exchanged). The infrared recordings showed the different growth structures for ice in freshwater compared to saltwater. Fresh water ice grew sharply while saltwater ice was more slushy and textured. The different freezing processes resulted in different transfer rates for each scenario.